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# Intelligent Automation Incorporated

## Coherent distributed radar for high-resolution through-wall imaging

### Progress Report 16

Contract No. N00014-10-C-0277

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## Summary

In this period of performance, we are continuing to develop the hardware, and software for the final demonstration.

## 1.0 INTRODUCTION

In this report we discuss progress in radar design, software design, and simulations

### 1.1 Improvements in wireless synchronization

We have reduced the timing bias observed in the synchronization system by more precisely defining the relationship between clocks used inside the FPGA.

### 1.2 Simulations

We are performing simulations to study use of wireless synchronization to improve ranging accuracy in the presence of multipath. Suppose we have a Synchronization Transceiver (ST) equipped with IMU move to sample a wide aperture, and a static ST in a nearby location, in a indoor environment. In this case, receiver beamforming can be used to steer the synthetic beam toward the transmitter for improved ranging, i.e. suppress multipath interference. Furthermore, steering the beam around can also identify multipath scatterers, e.g. walls.

Specifically, we assume 1) the receiver moves to different locations at different times, 2) the IMU records receiver relative position changes, and 3) the receiver performs Digital beamforming. We also study the application of MUSIC for more accurate Direction Of Arrival (DOA) Estimation (DOA)

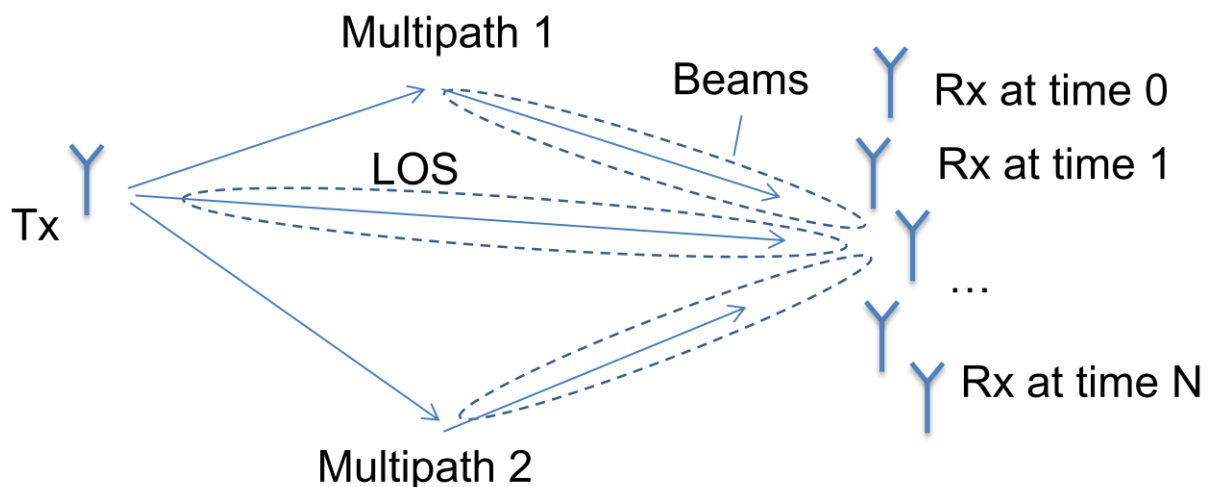


Figure 1. RF ranging between Synchronization Transceivers in a multipath environment.

In the next report we detail simulation results.